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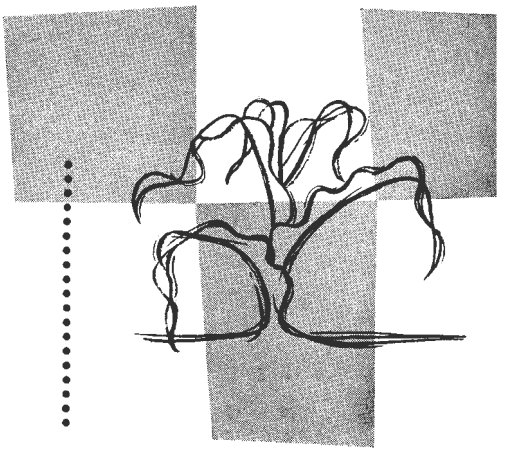

The kind of weather we have often is the deciding factor in crop yields in Iowa. The moisture used by crops comes from two sources — soil reserves and crop-season rainfall. Here's how we stand for the year ahead.

by R. H. Shaw and E. R. Duncan

WEATHER — particularly rainfall—often is the deciding factor in crop yields in Iowa. We've learned to "live with the weather" better in recent years, but we still can't control it. Newer techniques now are in common use on Iowa farms. Fertilizers, insecticides, herbicides, improved equipment, superior varieties and greater farming "know-how" certainly are having their influence on yields. But weather remains all-important on a season-by-season basis.

The question in this article is, "What influence will weather have on crop yields in 1960?" First, of course, we don't yet know what the weather will be like in 1960. But we still think we can give you some help from our experience and research. Especially helpful for this purpose are the results of our periodic soil moisture surveys. With this information, it's possible to make better estimates of the probable effects that weather will have.

We'll be talking about our dominant crop, corn, in this article, though the information applies generally to all full-season crops. Precipitation is of particular interest, but temperatures can be important, too.

Moisture: Winter precipitation is low and usually has little effect on soil moisture. Late fall precipitation is included in the soil moisture supply values we'll use. So, for the moment, we'll consider only warm-season precipitation—April through September. To estimate what effect precipitation will have on yields, we've divided it into three seasonal types—dry, average, wet. In the past, each of these has occurred about a third of the time.

For the April-September period, a *dry* season will have 18-20 inches or less of rainfall—with the lesser amount in the northwest and the greater amount in south-central and southeastern Iowa. If there's more than 22 inches in the northwest, ranging up to more than 26 inches in south-central Iowa, we call it a *wet* season. And if the rainfall is between 18-20 and 22-26 inches, the season is *average* insofar as rainfall is concerned. This considers only total rainfall, not its distribution.

We also divide the soil moisture reserve into three categories—low, medium, high. Research has shown that we need 22-24 inches of water during the April-September period to produce high corn yields. This can come from precipitation, soil moisture reserves or both. If the distribution of rainfall is poor, it may take more; if favorable, less.

In areas with low plant-available moisture (less than 5 inches in the top 5 feet), most of the water must come from warm-season rainfall. This calls for above-normal rainfall. With medium soil moisture (5-8 inches), high yields can be expected unless rainfall is below normal. With high soil moisture (8 inches or more), there should be plenty of water except in dry seasons; in wet years, there may be too much.

A wet year may occur when a wet, cool spring follows a wet fall. In this case, areas with low soil moisture have more potential to store rainfall and may not be hurt as much by high spring rainfall. Areas with high soil moisture have little space to store rainfall, and serious problems can arise from excess water—particularly in some of the heavy soils in southeast and south-central Iowa.

A good moisture supply is needed during the tasseling-silking period and for a few weeks thereafter regardless of total rainfall. We often have some dry weather in July and August. If this results in low soil moisture, yields can be cut severely. High temper-

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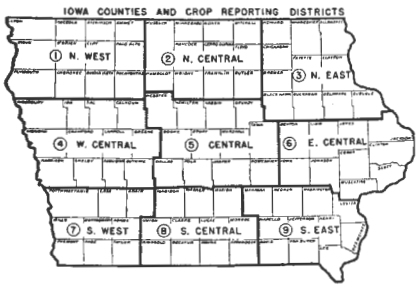
TABLE 1. Yield Predictions Made for 1959.

Crop reporting district	Soil moisture reserve in Nov. 1958	Rainfall Apr.-Sept. 1959	1959 yield predicted[a]	1959 estimated yield (Oct. 1)
NW	Low	Wet	Normal	Below to normal
NC	Medium	Wet	Above normal	Above normal
NE	Medium	Wet	Above normal	Above normal
WC	Medium	Average	Above normal	Above normal
C	Medium to high	Average	Above normal	Above normal
EC	High	Wet	Normal	Above normal
SW	High	Wet	Normal	Above normal
SC	High	Wet	Normal	Normal to above
SE	High	Wet	Normal	Above normal

[a]Presented at Crop Improvement Day, Ames, February 1959.



atures at the same time make the situation even more critical. Hot weather may spread out the time between tasseling and silking, and poor pollination may result. Even with good pollination, soil moisture stress at this time causes the greatest reduction in yield. This is a critical period for corn.

Last Year: Before considering 1960, let's see what happened in 1959. We estimated 1959 yield potentials last winter. We couldn't say what the precipitation would be in any area. But with the soil moisture reserves known, we predicted the yield prospects within the three classes of rainfall. Using only the rainfall classes which actually occurred in each area in 1959, the results are shown in table 1. How well did we do?

It looks as if we might have overestimated yield in the northwest. Distribution of rainfall hurt here. There was just enough rainfall in total to put it into the wet classification, but July averaged only slightly over ½ inch in the area. That hurt yields. Corn *must* have favorable moisture at and immediately following pollination. Some other areas (particularly in west-central Iowa) also had low July rainfall, but they had better soil moisture reserves to carry the corn through the dry weather. Locally there were areas which suffered considerable damage.

It also appears that we may have underestimated yield prospects in east-central and southern Iowa. We feared that, in a wet year and with high soil moisture reserves in these areas, we might have a wet spring—with late corn, low spots flooded out, depressed yields. This may have happened locally. But the fact that June rainfall was below normal helped the corn in these areas; in many years, this is when we get heavy rains and excess water. August rainfall was above normal in the southern part of the state. Again, the distribution was very important.

We were about right for the other areas of the state, except for local harvesting problems because of wind damage or other factors. We couldn't predict this, but only the general yield levels in the field.

What About 1960? Again, we've divided our soil moisture reserves and possible rainfall into three groups each. Our 1960 yield level predictions are shown in table 2 for the different areas.

Distribution of rainfall and temperatures will be important as the season progresses. But our estimates nonetheless indicate a *high yield potential for 1960. And the full potential is most likely to be realized if we should have about the following "ideal" corn weather as the season progresses:*

May: Slightly warmer and drier than normal where moisture reserves are adequate; near-normal rainfall where reserves are low. This gives good field conditions and gets the crop off to a good start.

June: Slightly warmer than normal to give good crop progress. In dry areas, normal or above-normal rainfall to build up soil moisture. In other areas, normal to slightly below-normal rainfall.

July-August: Temperatures 2-3 degrees below normal and above-normal rainfall. It's very important to have good rainfall and no extremely high temperatures during tasseling and silking and for 2-3 weeks following. Above normal rainfall is particularly important if there's a low soil moisture supply in early July.

By *September* primary interest is in weather that hastens drying. For this, a warm, dry September is best. Continued warm, dry weather in *October* rapidly brings the crop to the harvest stage.

Remember that we've assumed near-normal distribution of rainfall in our predictions. If distribution is poor and if high temperatures occur, yields can be lower than predicted. They can be higher if distribution is good. We'll find out how well we did next fall.

TABLE 2. Yield Estimates for 1960.

November soil moisture	Areas[a]	If 1960 rainfall, April 1-Sept. 30, is . . .	. . . then 1960 predicted yield is:
Low	NW (some areas)	Dry	Much below normal
		Average	Below normal
		Wet	Normal
Medium	NW (some areas) NC, WC, C	Dry	Below to normal
		Average	Above normal
		Wet	Above normal
High	NE, EC, SW, SC, SE	Dry	Below to normal
		Average	Above normal
		Wet	Normal

[a]Crop reporting districts.